

Midstream Operations to Turn Crude Oil into Fuels and Chemical Feed Stocks

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Description

Fractional distillation is a major type of operation used in oil refineries' midstream operations to turn crude oil into fuels and chemical feed stocks. For industrial use, cryogenic distillation results in the separation of air into its components, particularly oxygen, nitrogen and argon. Large quantities of crude liquid products of chemical synthesis are distilled in the chemical industry to separate them from other products, impurities, or unreacted starting materials. On perfumery-related Akkadian tablets dated around 1200 BCE, early evidence of distillation was discovered. The tablets provided textual evidence that the Babylonians of ancient Mesopotamia were familiar with a primitive early method of distillation. Distillation is a unit operation that is used in almost all industrial applications. However, it is not a chemical reaction; rather, it is a physical separation process. A distillery is a facility used for distillation, particularly of distilled beverages. Distillation of fermented products results in high-alcohol distilled beverages or separates other commercially valuable fermentation products. Desalination by distillation is a tried-and-true and efficient process. Distillation, also known as classical distillation, is the process of selective boiling and condensation, usually inside a still, to separate the components or substances of a liquid mixture.

Process of Heating Solid Materials

The process of heating solid materials to produce gaseous products, which can condense into liquids or solids, is known as dry distillation. This could involve chemical changes like cracking or destructive distillation. Distillation can either result in a partial separation that raises the concentration of specific components or a separation that is nearly complete, producing components that are nearly pure. Alchemists working in Alexandria in Roman Egypt in the first century also provided early evidence of distillation. Baked clay retorts and receivers from Taxila, Shaikhan and Charsadda in Pakistan, as well as Rang Mahal in India, which date back to the early Common Era, show that distillation was used in the ancient Indian subcontinent. These terracotta distillation tubes, according to Allchin, were made to look like bamboo. There was no effective way to collect the vapors at low heat, so these Gandhara stills could only make very weak liquor. Distilled water has been used since Alexander of Aphrodisias described the process around 200 CE. Under

Zosimus of Panopolis in the third century, work on the distillation of other liquids continued in the early Byzantine Egypt. According to archaeological evidence, beverages were first distilled during the Jin and Southern Song dynasties. Distillation in China may have begun during the Eastern Han dynasty. By the end of the thirteenth century, recipes for distilling wine with salt to produce aqua ardens (literally, burning water or ethanol) were appearing in a number of Latin works. By then, Western European chemists had come to know it well. Repeated distillation through a water-cooled still in the works of Taddeo Alderotti (1223-1296) is described as a method for concentrating alcohol that yields an alcohol purity of 90%. The procedure takes advantage of differences in the components of the mixture's relative volatility in either scenario. Oil stabilization is a type of partial distillation used in the petroleum industry to lower the vapor pressure of crude oil, making it safe to store and transport and lowering the amount of volatile hydrocarbons released into the atmosphere.

Components of the Mixture's Relative Volatility

The use of cold water, for instance, as a cooling system around the beak of these alembics enhanced the efficiency of alcohol condensation. The term for these was pot stills. In most industrial processes, more effective distillation techniques have largely replaced retorts and pot stills. Cognac, Scotch whisky, Irish whiskey, tequila, rum, cachaça and some vodka are all produced in large quantities using pot stills. Bootleggers in a variety of nations also make use of pot stills made of wood, clay, and stainless steel. Additionally, small pot stills are available for domestic production of essential oils or flower water. Batch processes that involved one vaporization and one condensation were the early forms of distillation. The condensate was further distilled to improve purity. By simply repeating the distillation, larger volumes were processed. According to reports, in order to obtain a pure compound, chemists performed between 500 and 600 distillations. The book of seventy, translated into Latin by Gerard of Cremona and published under the title Liber de septuaginta, is one example of a work attributed to the fractional distillation of organic substances. The main subject of the De anima in arte alchimiae, an originally Arabic work that was translated into Latin and would later become Roger Bacon's most important alchemical source, is the Jabirian experiments with fractional distillation of animal, vegetable, and, to a lesser

extent, mineral substances. In a Chinese archaeological site in Qinglong, Hebei province, a still from the 12th century was discovered. Between the 13th and 14th centuries, distilled beverages were popular. The book of the art of distillation out of simple ingredients, written by German alchemist Hieronymus in 1500, was the first book solely devoted to the subject of distillation. In 1512, a significantly expanded version of the book was published. The first major English compendium on distillation, *The Art of Distillation*, was published in 1651 by John French. However, it has been claimed that much of it is based on

the work of Braunschweig. This includes diagrams with people depicting the operation at the industrial rather than the bench scale. Retorts, or vessels, were used for distillations as alchemy became a branch of chemistry. Both alembics and retorts are types of glassware that have long necks that point to the side at an angle that goes down. These long necks serve as air-cooled condensers, allowing the distillate to condense and then drip down for collection. Copper alembics were developed later. Various mixtures, such as rye flour dough, were frequently used to keep riveted joints tight.